RELIGIOUSNESS AND SPIRITUALITY AS MODERATORS OF PHYSIOLOGICAL RESPONSES TO SOCIAL EVALUATIVE THREAT

by

Kevin David Jordan

A dissertation submitted to the faculty of
The University of Utah
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

Department of Psychology

The University of Utah

May 2014

The University of Utah Graduate School

STATEMENT OF DISSERTATION APPROVAL

The dissertation of Kevin David Jordan

has been approved by the following supervisory committee members:

Timothy W. Smith	, Chair	12/18/2013 Date Approved
Paula G. Williams	, Member	12/18/2013 Date Approved
Bert N. Uchino	, Member	12/18/2013 Date Approved
Paul H. White	, Member	12/18/2013 Date Approved
Kevin S. Masters	, Member	12/18/2013 Date Approved

And Carol Sansone by , Chair of the

Department Psychology of

and by David B. Kieda, Dean of The Graduate School.

ABSTRACT

A growing body of evidence suggests that individual differences in religiousness and spirituality (R/S) predict important health outcomes; however, the processes explaining these effects are not well understood. Specific physiological stress mechanisms have been hypothesized as potential mediators of the R/S – health relationship. Provided there has been exposure to a stressful event or stimulus, R/S may influence reactivity in the cardiovascular and neuroendocrine systems. A number of studies have found that some aspects of R/S attenuated or potentiated physiological responses to stress, but they have not used a conceptual perspective from which to organize and understand the effects of taxing social circumstances.

Using social self-preservation theory and the interpersonal theory of personality, social, and clinical psychology, the present study examined the association of various aspects of R/S with emotional and physiological reactivity and recovery in response to social-evaluative threats involving agency (i.e., striving for achievement and status) and communion (i.e., striving for connection with others). Multiple aspects of R/S were assessed (and reduced via factor analysis) to examine their moderating effect on emotional and physiological responses during and after two types of social-evaluative threat. Emotional responses included self-reported anxiety and shame. Physiological

responses included salivary cortisol, heart rate, and systolic/diastolic blood pressure, all of which are widely studied mechanisms in studies of psychosocial vulnerability.

Overall, social evaluative threat led to psychophysiological reactivity (e.g., increased anxiety, increased self-conscious emotions), and increased cardiovascular and neuroendocrine (i.e., cortisol) reactivity, all of which is consistent with social self-preservation theory. Contrary to predictions, the R/S factors generally did not predict emotional and physiological responses, and did not moderate the effects of stress. These results are somewhat surprising given the warm interpersonal style associated with R/S. Possible reasons for these null findings are discussed. These include the use of self-report to assess R/S, the limited relevance of the stressor to R/S individuals, and other considerations. R/S could influence health and well-being more so through day-to-day stress exposure, which was not assessed in the present study. Future studies are recommended such as daily diary protocols in which day-to-day stress exposure can be assessed.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

Religion and spirituality are important aspects in the lives of many people, with potentially important effects on the individual's health and well-being. Over 90% of Americans believe in a higher power, 58% pray at least once a day, and 39% go to a religious service at least once a week (Pew Forum, 2008). A growing body of evidence suggests that individual differences in these beliefs and activities predict important health outcomes, such as longevity, the incidence of serious illness (Chida, Steptoe, & Powell, 2009; Masters & Hooker, 2013; McCullough, Hoyt, Larson, Koenig, & Thoresen, 2000), and emotional adjustment (T. B. Smith, McCullough, & Poll, 2003). These associations of religiousness and spirituality (R/S) with physical health and emotional adjustment may in part be due to their role in buffering the otherwise adverse effects of stress. Specifically, some forms of R/S may contribute to less emotional and physiological reactivity to stressful events and circumstances, and more rapid emotional and physiological recovery after such stressors. The present study will examine the role of individual differences in R/S as moderators of emotional and physiological responses to psychological stressors.

Although related, religion and spirituality are distinguished by the ways they are practiced, organized, and manifested. Religion has been defined as "a system of beliefs in a divine or superhuman power, and practices of worship or other rituals directed towards

such a power" (Argyle & Beit-Hallahmi, 1975, p. 1). Religiousness, in turn, refers to the individual difference concerning the extent to which people assign importance to such beliefs and/or engage in such practices. Spirituality has been characterized as "the search for existential meaning" (Doyle, 1992, p. 302). Spirituality tends to be more subjective and privatized compared to religion. It includes certain practices such as meditation, and like religion, it is oriented towards a sacred object or notion, but this object need not be a divine being (Zinnbauer et al., 1997).

Religiousness and spirituality are multidimensional individual differences (Moberg, 2002). For example, religiousness includes doctrinal beliefs, organizational behavior (e.g., service attendance), nonorganizational behavior (e.g., private prayer, personal Scripture study), and religious orientation (i.e., intrinsic, extrinsic). Spirituality includes a search for purpose and direction in life, connection with a transcendent aspect of life, a sense of belonging or connectedness to a community, a search for ultimate truth, appreciation and gratitude, and transformation/spiritual growth (Lapierre, 1994).

The Relationship Between R/S and Health

Religion and spirituality can "provide a comprehensive framework for perceiving, understanding and evaluating [one's] experience as well as organizing and directing [one's] behavior" (Park, 2007, p. 320). This framework is thought to increase one's resilience and emotional adjustment. For example, religious coping and spirituality are associated with less depression and anxiety and psychological growth for individuals facing significant life stressors (Ai, Park, Huang, Rodgers, & Tice, 2007; Prati & Pietrantoni, 2009). Aspects of R/S have been found to be inversely related to depressed

affect (Ellison & Flannelly, 2009; T. B. Smith et al., 2003) and positively related to self-esteem and well-being (Whittington & Scher, 2010). Salutary effects on well-being are particularly notable for intrinsic religiousness (Bergin, Masters, & Richards, 1987; Hackney & Sanders, 2003), which refers to a religious orientation that is internally motivated and in which religion is an "end" in itself. In contrast, extrinsic religiousness refers to a religious orientation where religion is a "means" to an end that is externally or instrumentally motivated by some other concern (e.g., social acceptance). The extrinsic religious orientation is often associated with poorer emotional adjustment (T. B. Smith et al., 2003).

An extensive literature demonstrates positive effects of R/S on physical health, as well (Koenig, McCullough, & Larson, 2001; Powell, Shahabi, & Thoresen, 2003). There are some discrepant findings, but reliable associations between R/S and health are emerging. Early prospective studies found an inverse association between church attendance and mortality (Comstock & Partridge, 1972; House, Robbins, & Metzner, 1982; Zuckerman, Kasl, & Ostfeld, 1984). These findings have been confirmed in subsequent studies in different countries and ethnicities (Hummer, Rogers, Nam, & Ellison, 1999; Levin & Vanderpool, 1987; Strawbridge, Cohen, Shema, & Kaplan, 1997; Zhang, 2008). In a systematic review and meta-analysis, McCullough and colleagues (2000) found a 37% increase in survival for those who attended church regularly, a noteworthy finding given the statistical control of potential confounds (e.g., age, race, initial health status, social support, health behaviors).

In a more recent meta-analysis, Chida et al. (2009) also found an association between R/S and mortality. The favorable effect was primarily found in initially healthy

populations, rather than among individuals with existing illness. This difference could indicate that the meaning of various aspects of R/S differs across healthy and ill populations. When sick, activities such as church attendance often decrease while activities such as prayer often increase. Studying certain aspects of R/S such as prayer among the medically ill may mask the positive effects of R/S (Helm, Hays, Flint, Koenig, & Blazer, 2000). As noted previously, the associations of R/S with health and well-being are mixed (George, Larson, Koenig, & McCullough, 2000; Helm et al., 2000; Milot & Ludden, 2009), perhaps reflecting different associations with health across various aspects of this domain (e.g., intrinsic vs. extrinsic religiousness) (T. B. Smith et al., 2003).

Mechanisms Linking R/S with Physical Health and Well-being

One way that R/S may influence physical health and emotional outcomes is through health behaviors. For example, religious adolescents are less likely to engage in a variety of risky behaviors (e.g., alcohol consumption) and more likely to engage in positive health habits (e.g., seat belt use, regular exercise, adequate sleep) (Wallace & Forman, 1998). R/S may also promote earlier treatment seeking, better adherence to medical regimens, and better continuity of medical care (King & Pearson, 2003; Park, Moehl, Fenster, Suresh, & Bliss, 2008; Zollinger, Phillips, & Kuzma, 1984). Social support, an interpersonal factor that is associated with a host of positive emotional and physical health outcomes (Reblin & Uchino, 2008), is one of the more frequently examined mechanisms. In some studies, social support fully or partially mediates associations between R/S and well-being, health behaviors, morbidity, and longevity

(George, Ellison, & Larson, 2002; Johnson, Sheets, & Kristeller, 2008; McCullough et al., 2000; Strawbridge, Shema, Cohen, & Kaplan, 2001).

Psychological processes associated with R/S might also function as mechanisms. As mentioned previously, individual aspects of R/S are associated with emotional adjustment and maladjustment (T. B. Smith et al., 2003). The salubrious effect of R/S on health might operate through these psychological processes. Other psychological constructs related to R/S might also play a role. Forgiveness has been associated with reduced physiological responses to stress, including blood pressure and cortisol (Harris & Thoresen, 2005), perhaps because it reduces rumination and hostility after interpersonal offenses (Ysseldyk, Matheson, & Anisman, 2007). Compassion may have similar effects (Steffen & Masters, 2005). Gratitude is associated with some aspects of R/S (Emmons & Kneezel, 2005), and it predicts health and well-being particularly when dealing with stress (Froh, Sefick, & Emmons, 2008; Krause, 2006; Wood, Joseph, Lloyd, & Atkins, 2009), perhaps by facilitating prosocial responses to others (Emmons, 2009).

In many of the models of mechanisms linking R/S with health and well-being, stress processes are a key proximal mechanism. For example, people who have more frequent, larger, or more prolonged cardiovascular reactions to stressful stimuli may be at higher risk for hypertension and coronary artery disease (Chida & Steptoe, 2010; Manuck, 1994). R/S may be inversely associated with cardiovascular disease because of lower reactivity to stressors or more rapid recovery of cardiovascular responses after stress exposure (Light, 2001; Treiber et al., 2003). Masters and colleagues (2004) found that some aspects of religiousness (i.e., intrinsic religiousness) attenuated age-related increases in cardiovascular reactivity, whereas other aspects (i.e., extrinsic religiousness)

did not. These varied effects of specific aspects of R/S on stress responses may explain some of the inconsistent associations with health outcomes described above. Some evidence suggests that the effects of R/S on cardiovascular reactivity may be more pronounced for interpersonal or social stressors (e.g., role played stressful interactions) than for nonsocial stressors (e.g., mental arithmetic; Masters, Lensegrav-Benson, Kircher, & Hill, 2005).

The effects of R/S on emotional and physiological recovery after stress exposure have been studied less frequently. Training in mindfulness meditation produced better recovery (i.e., lower electrodermal activity) after exposure to emotional stimuli (Ortner, Kilner, & Zelazo, 2007). Though mindfulness meditation is not necessarily related to R/S, it does provide limited evidence that aspects of R/S (e.g., prayer) may have similar effects. Rumination contributes to poor recovery following stressors (Gerin, Davidson, Christenfeld, Goyal, & Schwartz, 2006), and forgiveness helps a person to "forgive and forget," presumably leading to reduced rumination and better recovery (Lawler et al., 2005).

Finally, these physiological mechanisms also involve endocrine responses, especially cortisol reactivity. In response to a laboratory stressor, individuals with higher composite R/S scores and frequency of prayer showed smaller cortisol responses (Tartaro, Luecken, & Gunn, 2005). In an HIV population, Ironson and colleagues (2002) found that cortisol functioned as a mediator between R/S and survival. However, other studies have not found a relationship between R/S and cortisol responses (Yeager et al., 2006).

Interpersonal Theory and Its Application to Psychosocial Risk Factors

The interpersonal perspective in social, personality, and clinical psychology has been useful in understanding risk for emotional distress and dysfunction (for reviews, see Horowitz & Strack, 2011; Pincus & Ansell, 2003), and has more recently been applied to psychosocial risk factors for disease (Gallo, Smith, & Ruiz, 2003; T. W. Smith, Glazer, Ruiz, & Gallo, 2004; T. W. Smith, Traupman, Uchino, & Berg, 2010). Most models of the association of R/S with emotional adjustment and physical health have emphasized intrapersonal as opposed to social processes. However, in many ways, religion and spirituality are relational phenomena with interpersonal features and correlates. For example, in our recent work (Jordan, Masters, Hooker, Ruiz, & Smith, in press), some aspects of R/S (e.g., intrinsic religiousness) were associated with a warm interpersonal style and positive interpersonal experiences (e.g., higher social support, lower interpersonal conflict), whereas other aspects were associated with a hostile interpersonal style and negative interpersonal experiences. These differing interpersonal correlates might contribute to the differing associations of aspects of the broader R/S domain with physical health and emotional adjustment described previously.

In interpersonal theory (Wiggins, 1979; Wiggins, Phillips, & Trapnell, 1989), two higher-order dimensions underlie interpersonal behavior - *control* (dominance vs. submission) and *affiliation* (friendliness vs. hostility). These dimensions are the axes of the interpersonal circumplex (IPC, see Figure 1). The IPC is the primary structural component of interpersonal theory, and related measurement procedures provide information on interpersonal styles. These IPC dimensions also describe broad social motives. *Communion* refers to striving for connection with others and corresponds to the

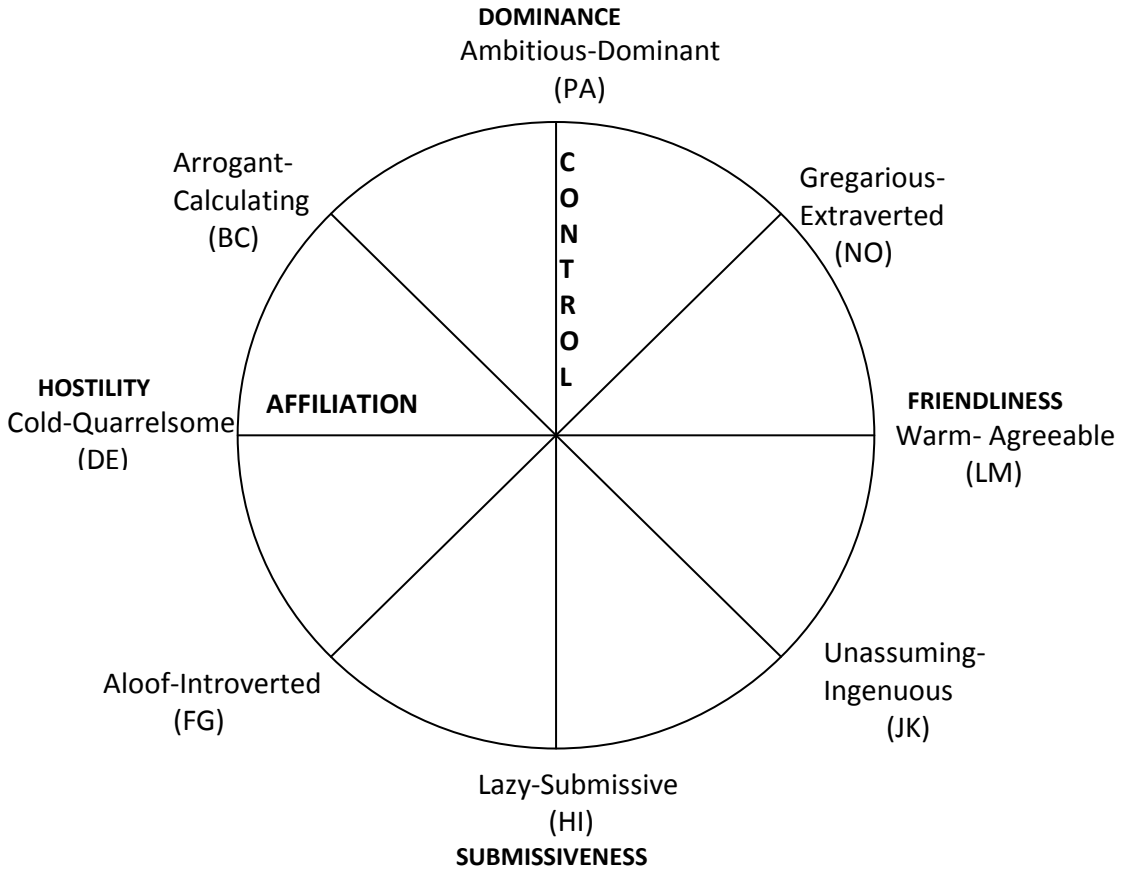

Figure 1. The interpersonal circumplex

affiliation axis of the IPC. *Agency* refers to striving for separateness, achievement, influence, and status and corresponds to the control dimension. (Horowitz et al., 2006; Locke, 2006). As an indication of the importance of these motives, positive connection with others (i.e., acceptance, approval, affection) and prestige or status in the eyes of others (e.g., success, achievement) are significant and independent sources of self-esteem (Leary, Cottrell, & Phillips, 2001).

A variety of stressful social circumstances have adverse, long-term effects on emotional adjustment and physical health. Social self-preservation theory is one

conceptual perspective from which to understand such effects of social stressors (Dickerson, Gruenewald, & Kemeny, 2004). Threats to the social self include, "threats to one's social esteem, status, and acceptance" (2004, p. 1193). Threats to the social self have been shown to evoke increases in negative affect, cortisol, and cardiovascular parameters such as heart rate and blood pressure. This model emphasizes cortisol responses as perhaps the clearest physiological index of the degree of social-evaluative threat (Dickerson et al., 2004).

From the perspective of interpersonal theory, social-evaluative threats could involve either or both of the two broad motives described previously. That is, either the desire to be accepted by others or the desire for achievement and respect could lead to pronounced emotional and physiological responses to potential stressors. Typically, experimental studies based on social self-preservation theory have emphasized agency threats, using speech tasks or mental arithmetic tasks in which there are one or more evaluating observers (Bosch et al., 2009; Gruenewald, Kemeny, Aziz, & Fahey, 2004). Such tasks clearly increase the salience of maintaining the social self, but are largely agentic – as opposed to communal – stressors. Studies of evaluative threats emphasizing achievement, status, or competence evoke substantial increases in negative affect and physiological reactivity (T. W. Smith, Nealey, Kircher, & Limon, 1997). Threats to acceptance and inclusion (e.g., potential rejection, ostracism, exclusion) have clear negative effects across a wide range of emotional, behavioral, and physiological responses (Dickerson, 2011; Eisenberger, 2012; Macdonald & Leary, 2005). However, few studies have specifically manipulated threats to acceptance and status independently, while measuring a comprehensive set of affective, cardiovascular, and endocrine stress

responses. Hence, the relative magnitude of the effects of these two social threats has not been examined, nor has their potentially synergistic effect.

If R/S influence health and well-being through interpersonal processes generally and stress mechanisms in particular, then individual differences in R/S should moderate emotional and physiological responses to these two basic social stressors. Some aspects of R/S may have salubrious effects on such responses (e.g., intrinsic religiousness), whereas other aspects could be detrimental (e.g., extrinsic religiousness). Further, aspects of R/S might have different roles in responses to threats involving communion as opposed to agency.

Present Study

The present research examined the association of various aspects of R/S with emotional and physiological reactivity and recovery in response to social-evaluative threats involving agency and communion. Social evaluative threat was manipulated in a 2 x 2 design (i.e., high vs. low Agency Threat; high vs. low Communion Threat). Multiple aspects of R/S were assessed to examine their moderating effect on emotional and physiological responses during and after the two types of social-evaluative threat. Emotional responses included self-reported anxiety, anger, and self-conscious emotions (e.g., shame). Anxiety and anger are commonly examined emotional responses to social stressors. Shame has been implicated as a particularly important response to threats to the social self (Dickerson et al., 2004). Physiological responses included salivary cortisol, heart rate, and systolic and diastolic blood pressure. Cardiovascular responses are a widely-studied mechanism in studies of psychosocial vulnerability (Chida & Steptoe,

2010), and as noted previously cortisol responses are particularly important in threats to the social self (Dickerson et al., 2004).

We predicted that some aspects of religiousness (e.g., intrinsic religiousness) and spirituality (e.g., the ability to create meaning and purpose) will be associated with smaller stress responses, whereas other aspects of religiousness (e.g., extrinsic religiousness) may potentiate stress responses. In additional exploratory analyses, other individual differences related to religiousness and spirituality such as mindfulness (Baer, Smith, & Allen, 2004) and nonattachment (Sahdra, Shaver, & Brown, 2010) will also be examined as possible moderators.

METHOD

Participants

The present sample consisted of 153 undergraduates (75 females; mean age = 23.2 years, *SD* = 5.1) enrolled in the subject pool of the University of Utah's Psychology Department. Seventy percent of the participants were Caucasian, 14% Hispanic/Latino, 8% Asian, 3% African American, 3% American Indian, and the remaining were other ethnicity or not reported. Regarding self-reported religion, 37% were Latter-Day Saints (LDS), 16% Atheist, 15% Christian, 5% Roman Catholic, 4% Buddhist, 3% Muslim, 2% each Lutheran and Methodist, 1% each Episcopalian and Unitarian, and the remaining were other religion or not reported. Prior research indicates that the broad social motives of agency and communion are relevant to undergraduates (McAdams, Hoffman, Mansfield, & Day, 1996). Participants were required to refrain from caffeine consumption and use of nicotine for at least 2 hours prior to the laboratory session. Participants taking medications known to impact cardiac or cortisol activity (e.g., beta blockers, steroids) were excluded from the present study.

Measures

Questionnaire measures

The following questionnaires were completed on Survey Monkey using a laptop computer.

Religious orientation. The Intrinsic/Extrinsic Scale – Revised (I/E-R) measures intrinsic and extrinsic religious motivation (Gorsuch & McPherson, 1989). Individuals who are intrinsically motivated to participate in religion are internally committed to live their religion and those who are extrinsically motivated to participate in religion do so because of external factors, such as social support or emotional comfort. In the present sample, the reliabilities of the intrinsic and extrinsic scales were .85 and .81, respectively. In our work, IR is associated with a warm interpersonal style, and ER is associated with a hostile, controlling interpersonal style (Jordan et al., in press).

Multidimensional assessment of R/S. The Brief Multidimensional Measure of Religiosity and Spirituality (BMMRS) assesses multiple R/S dimensions. A national working group commissioned by the Fetzer Institute and the National Institute on Aging (1999; Idler et al., 2003) developed this measure to serve as the standard in research relating 12 R/S dimensions to health. A recent factor analysis of this measure suggests there are seven dimensions: experiential comforting faith, personal spirituality, religious community support, private religious practices, negative religious interaction, punishing God, and forgiveness (Masters et al., 2009). The reliabilities for these scales range from .63 to .94 (Masters et al., 2009). In the present sample, reliabilities ranged from .55 to .94. The BMMRS has adequate convergent and divergent validity (Johnstone, McCormack, Yoon, & Smith, 2012).

Spirituality. The 23-item Functional Assessment of Chronic Illness Therapy-Extended Spiritual Well-Being Scale (FACIT-Sp-Ex) is an extended version of the original 12-item scale, and it measures meaning, peace, and faith along with additional spiritual concerns (Brady, Peterman, Fitchett, & Cella, 1999). The scale has good internal consistency (in the present sample, α ranged from .84 to .89) and there is evidence of convergent validity (Holt-Lunstad, Steffen, Sandberg, & Jensen, 2011; Peterman, Fitchett, Brady, Hernandez, & Cella, 2002). The Assessment of Spirituality and Religious Sentiments Scale (ASPIRES) assesses underlying motivational aspects of religion, including religiosity, religious crisis, connectedness to something greater than the self, prayer fulfillment (ability to create a positive connection to some larger reality), and universality (the belief of a larger sense of meaning or purpose in life) (Piedmont, 2004). The connectedness, prayer fulfillment, and universality scales are combined to create the Spiritual Transcendence Scale. The scale has good construct validity (Piedmont, Ciarrochi, Dy-Liacco, & Williams, 2009), and in the present sample, the internal consistencies of the three scales were .65, .84, and .89, respectively.

Mindfulness and nonattachment. The Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al., 2004) measures a person's ability to focus attention in a nonjudgmental way. The practice of mindfulness originates from Eastern meditation traditions. The KIMS measures four elements of mindfulness – observing, describing, accepting without judging, and acting with awareness. The scales demonstrate good construct validity (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Christopher & Gilbert, 2010). Internal consistencies ranged from .72 to .89 in the present sample. The Buddhist notion of "nonattachment" will be assessed by the Nonattachment Scale

(Sahdra et al., 2010). This measure assesses a person's ability to release him/herself from mental fixations. It demonstrates good convergent/divergent validity with positive associations with mindfulness and nonreactivity, and relatively low correlations with avoidant attachment and alexithymic tendencies (Sahdra et al., 2010). The internal consistency of the scale was .93 in the present sample.

Interpersonal style. A brief assessment of the dimensions of the IPC, the International Personality Item Pool – Interpersonal Circumplex (IPIP-IPC), was used (Markey & Markey, 2009). Dominance and affiliation scale scores were calculated from circumplex weighting of the IPIP octants, and internal consistencies were .64 and .80, respectively. The IPIP-IPC was used to determine the "interpersonalness" and interpersonal style of the R/S factors. The IPIP-IPC maintains the good psychometric properties and circular structure of longer measures such as the Interpersonal Adjective Scale (Markey & Markey, 2009).

Pretest questionnaires. State affect measures (e.g., anger, anxiety, self-conscious emotions) were administered in order to assess current psychological and affective status. Participants were asked to indicate how they currently felt. Twelve items, derived from the State-Trait Personality Inventory (Spielberger, 1980), assessed anger and anxiety. For example, participants indicated the degree to which they felt "calm" or "annoyed." Two items not found on the original Spielberger scale were added (i.e., "I feel kind and warmhearted" and "I feel friendly") to reduce floor effects (Nealey-Moore, Smith, Uchino, Hawkins, & Olson-Cerny, 2007). The reliabilities for pretest anxiety and anger were .79 and .63, respectively. Self- conscious emotional states such as "embarrassed" and "exposed" were assessed by the State Self-Conscious Emotions scale, which is

adapted from the PANAS and literature on shame (Dickerson, Mycek, & Zaldivar, 2008; Lewis, 1971; Watson, Clark, & Tellegen, 1988). The reliabilities for shame and pride were .84 and .93, respectively.

First posttask questionnaire. State affect measures were readministered in order to assess psychological and affective change that may have occurred during the manipulation of social evaluation. The reliabilities for posttask anxiety and anger were .85 and .88, respectively. The reliabilities for shame and pride were .93 and .93, respectively. Participants also completed an adapted version of the Circumplex Scales of Interpersonal Values (CSIV; Locke, 2000) in order to assess what was or was not important for the participant during the tasks just completed. Participants rated how important certain values were. For example, "During the speaking tasks it was _____ that I keep my guard up." The CSIV has a circular structure made up of eight scales corresponding to specific interpersonal values, and they demonstrate convergent and divergent validity (Locke, 2000). Circumplex weighted factor scores were calculated for dominance and affiliation, and internal consistencies were .65 and .52, respectively.

Second posttask questionnaire. State affect measures were readministered in order to assess psychological and affective status after the recovery period. The reliabilities for anxiety and anger after recovery were .80 and .76, respectively. The reliabilities for shame and pride were .93 and .95, respectively. Rumination about the task was assessed with the Rumination and Reflection Questionnaire, which demonstrates convergent validity with similar constructs (RRQ; Trapnell & Campbell, 1999). The RRQ had an internal consistency of .91 in the present sample. Finally, single item scales assessed how important it was for the participant to appear likeable, intelligent,

interesting, competent, friendly, and skilled during the speaking tasks. The participants answered each question using a scale ranging from "Not at all" to "Very much so." An example item includes, "During the speaking tasks, how important was it for you to appear likable?" These single item scales were not associated with any variables of interest; therefore, results will not be reported below.

Physiological measures

Blood pressure. A Dinamap Model 100 was used to measure systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP). The Dinamap uses the occillometric method to calculate blood pressure. Blood pressure assessments were obtained using a properly sized occluding cuff positioned on the upper left arm of the participant according to manufacturer's specifications. Mean SBP, DBP, and MAP for each epoch (i.e., baseline, tasks, recovery) were averaged across 90-second intervals to increase the reliability of these assessments (Kamarck, Jennings, Debski, & Glickman-Weiss, 1992).

Impedance cardiography and heart rate variability. Seven spot electrodes were placed in a hepta polar configuration according to published guidelines (Sherwood, Dolan, & Light, 1990). A Mindware 2000D Impedance Cardiograph was used to measure electrocardiography (ECG), basal thoracic impedance (Z_O), and the first derivative of the impedance signal (dZ/dt). Analysis Software 5.2 (Mindware Cardiography, Gahanna, OH) was used to verify, edit, and summarize cardiovascular data. Through spectral analysis of the interbeat interval series, it was also used to determine high frequency heart rate variability (hf-HRV) (T. W. Smith, Cribbet, et al., 2011).

Cortisol. Salivary cortisol was collected with Sarstedt® cortisol salivettes and stored below freezing before being shipped to Clemens Kirschbaum's research laboratory at the Technical University of Dresden to be assayed. This lab uses a time-resolved immunoassay with flurometric endpoint detection (for a review, see Dressendörfer, Kirschbaum, Rohde, Stahl, & Strasburger, 1992). The unit of measurement for the analyte is nmol/l. The IBL-International CLIA (i.e., international clinical laboratory certification) for cortisol has very good performance characteristics (Miller, Plessow, Rauh, Gröschl, & Kirschbaum, 2013). Both the intra- and inter-assay coefficients of variation are below 5% and the lower sensitivity of the assay is 0.2 nmol/l. Cortisol was collected between 11am and 5pm as suggested by a recent review (Dickerson et al., 2004). Per guidelines in this review, cortisol was collected at baseline, 5 minutes after the conclusion of the tasks (approximately 30 minutes after stressor onset), and 10 minutes later.

Procedure

Temporal sequence

Participants reported to the laboratory for a 120-minute experiment between the hours of 11am and 3pm. A timeline of the study is presented in Figure 2. Participants were introduced to the study and signed informed consent. They were then asked to report demographic information including religious affiliation. They completed measures of R/S and IPC dimensions.

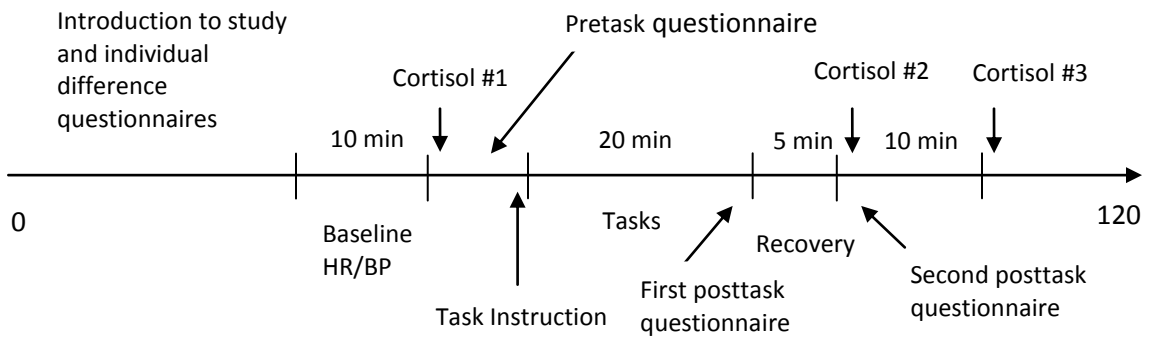

Figure 2. Temporal sequence of measurements and tasks

Baseline

A 10-minute baseline for physiological measures was assessed during a minimally engaging task. Audio instructions guided the participants through the task. The participants had 1 minute to look at two pictures of pleasant scenery and selected the picture they preferred. Audio instructions informed the participants when to turn to the next pair of pictures, and this process was repeated until the tenth pair had been rated. BP was collected at 10 seconds, 300 seconds, 390 seconds, 480 seconds, and 570 seconds.

Experimental tasks

Evaluative threat conditions were manipulated in the same manner as in prior studies in our laboratory (T. W. Smith et al., 1997). Participants were exposed to one of four conditions. In the communion threat condition, participants were told that raters would judge how likable, interesting, and friendly they were. In the agency threat condition, participants were told that raters would judge how intelligent, competent, and

skilled they were. In the combined threat condition, they were told that raters would judge how likable, interesting, and friendly they were as well as how intelligent, competent, and skilled they were. In the control condition, the participants were told that they need to respond to the tasks but their responses would in no way be evaluated. Also, observers were not present in the control condition. Through audio instructions, tasks were then given to the participants in which they talked about the following: (1) one's typical daily schedule, (2) one's college major, long-term career interests, and how one's major helps one get there, and (3) role playing an interaction with a hostile passenger in a car accident. For each speaking task, BP was assessed 10 seconds after the participant began talking. Each task involved two parts in which the participant responded for 90 seconds. For example, for the first task (e.g., talking about one's daily schedule), the participant heard the following audio instruction and was also given a hard copy to follow along:

> For the first task, please describe your typical daily schedule. For the next 90 seconds, please describe: when you get up, what you do until lunch, and what you do for lunch; then describe what you do until dinner, and what you typically do for dinner; finally, please describe what you do after dinner until you go to bed. Of all the people you see during the usual day, which ones are most important? Why are they the most important? Please try to speak for the full 90 seconds. Please begin now.

After speaking for 90 seconds, the participants heard the following:

> Thank you (4-second pause). In the typical daily schedule you just described, which of these activities are fully or mostly your choice? Which ones of these activities are better seen as obligations, rather than choices? What do these choices and obligations say about you as a person? What good qualities about you do they reflect? What qualities about you do they reflect that you would like to change? Please try to speak for the full 90 seconds. Please begin now.

Two “judges” were present in the threat conditions to make ratings on a clipboard as the participant talked. They made their first rating 10 seconds into the speaking task and their second rating at the end of the 90-second interval.

In total, the experimental tasks took approximately 21 minutes to complete. After this period, the participants had a 5-minute recovery period in which they sat quietly and completed a short questionnaire. During the recovery period, BP was assessed at 30 seconds, 120 seconds, 210 seconds, and 300 seconds.

RESULTS

Factor Analyses

Principal components analysis was used to reduce the R/S variables (i.e., FACIT factors, STS factors, IR/ER, and BMMRS factors). Results of the direct oblimin rotation with Kaiser normalization indicated that the factors should be orthogonally rotated because the two factors were correlated at -.078, which is less than the cutoff level suggested by Tabachnick and Fidell (2006). The orthogonal rotation method used was varimax. Initial eigenvalues were 7.71 for factor I with 47.19% of explained variance, and 1.76 for factor II with an additional 11.75% of explained variance. Factor I was labeled "RSadaptive" and factor II was labeled "RSmaladaptive." The distinguishing feature of factor II was the positive loadings of the BMMRS punishing God and BMMRS negative religious interactions at .78 and .73, respectively.

Principal components analysis was also used to reduce the mindfulness factors and the nonattachment scale. Results of the direct oblimin rotation with Kaiser normalization indicated that the factors should be orthogonally rotated because the two factors were correlated at .090. The orthogonal rotation method used was varimax. Initial eigenvalues were 1.87 for factor I with 37.39% of explained variance and 1.17 for factor II with an additional 23.37% of explained variance. Factor I was labeled "nonjudgmental awareness" and the KIMS awareness, KIMS acceptance, and the nonattachment scale

loaded on it. Factor II was labeled “active noticing” and the KIMS observe and describe scales loaded on it.

Interpersonal Style

The RSadaptive, nonjudgmental awareness, and active noticing scale were all associated with a warm interpersonal style with varying degrees of association with the control axis of the IPC (see Table 1). The RSmaladaptive factor, on the other hand, was associated with a hostile interpersonal style. The interpersonal styles associated with the RSadaptive and RSmaladaptive factors replicate our findings of the interpersonal characteristics associated with similar religious and spiritual individual difference measures (Jordan et al., in press). The findings of the mindfulness factors extend these results and reveal a common association with friendliness on the IPC. The nonjudgmental awareness factor stands apart from these measures in regard to its significant negative association with the control dimension of the IPC.

Manipulation

State affect and physiological changes

The following results present the findings of the average change in state affect after the experimental tasks and recovery compared to baseline. Table 2 presents the mean differences.

Anxiety. As predicted, during the task period, self-rated anxiety significantly increased in the communion threat condition and trended towards significance in the agency threat condition (see Table 2). Gender was not associated with anxiety change,

Table 1

Regression Results of R/S Factors on IPIP-IPC Control and Affiliation

Scale	*R*	*F* (1,145)	β Control	β Affiliation
RS adaptive factor	.36	8.457***	-.17	.359***
RS maladaptive factor	.34	7.481**	-.051	-.331***
Nonjudgmental awareness	.44	12.69***	-.207*	.390***
Active noticing	.28	4.781*	.138	.224*

** p < .05; ** p < .01; *** p < .001*

Table 2

ANOVA results for mean differences of state affect and physiological change

	Communion Threat				Agency Threat			
	High	Low			High	Low		
Change	Mean	Mean	F(1,145)	η^2	Mean	Mean	F(1,145)	η^2
Task anxiety change	5.45 (.44)	3.39 (.43)	11.29**	.075	4.98 (.43)	3.86 (.43)	3.40[a]	.024
Task SCE change	5.65 (.81)	3.25 (.79)	4.53*	.032	5.99 (.80)	2.91 (.79)	7.46**	.051
Recovery anxiety change	2.29 (.32)	.79 (.31)	11.25**	.075	1.80 (.32)	1.28 (.32)	1.35	.01
Recovery SCE change	1.52 (.55)	1.20 (.53)	.18	.001	2.07 (.54)	.65 (.54)	3.48[b]	.024
Posttask rumination	28.57 (1.01)	24.64 (.99)	7.77**	.053	27.85 (1.00)	25.36 (.99)	3.13[c]	.022
SBP change	22.96 (1.01)	15.23 (1.02)	29.1***	.177	22.80 (1.01)	15.41 (1.03)	26.4***	.163
DBP change	12.04 (.67)	9.05 (.67)	9.99**	.069	12.21 (.66)	8.88 (.68)	12.38**	.084
HR change	12.20 (.91)	6.69 (.92)	18.1***	.119	11.00 (.91)	7.89 (.92)	5.78*	.041
Cortisol change	2.87 (.73)	-.38 (.75)	9.70**	.070	2.63 (.74)	-.14 (.74)	7.02**	.052
Recovery SBP change	9.31 (.76)	4.62 (.77)	19.0***	.124	8.67 (.76)	5.27 (.77)	10.01**	.070

** $p < .05$; ** $p < .01$; *** $p < .001$; [a] ($p = .060$); [b] ($p = .064$); [c] ($p = .079$)*

$F(1,145) = 2.09$, $p = .15$, $\eta^2 = .015$, and none of the interactions were significant. During the recovery period, the communion threat condition continued to predict increased self-rated anxiety (see Table 2).

Anger. The main effect for agency threat on anger was not significant, $F(1,145) = .97$, $p = .33$, $\eta^2 = .007$, nor was the main effect for communion threat, $F(1,145) = .53$, $p = .47$, $\eta^2 = .004$. Gender was not associated with anger change, $F(1,145) = .68$, $p = .41$, $\eta^2 = .005$, and none of the interactions were significant.

Self-conscious emotions. As predicted, during the task period, self-conscious emotions increased in both the agency and communion threat conditions (see Table 2). Additionally, there was a main effect for gender, $F(1,145) = 4.21$, $p = .04$, $\eta^2 = .029$, with females reporting a greater increase in self-conscious emotions compared to males. There was also a significant interaction between gender and the communion threat condition, $F(1,145) = 3.94$, $p = .049$, $\eta^2 = .028$ (see Figure 3). Compared to men, women had a greater increase in self-conscious emotions in the high communion threat condition. During the recovery period, there was a trend towards increased self-conscious emotions in the agency threat condition (see Table 2).

Pride. The main effect for agency threat on pride was not significant, $F(1,145) = 1.28$, $p = .26$, $\eta^2 = .009$, nor was the main effect for communion threat, $F(1,145) = 2.83$, $p = .10$, $\eta^2 = .020$. Gender was not associated with pride change, $F(1,145) = .60$, $p = .44$, $\eta^2 = .004$, and none of the interactions were significant.

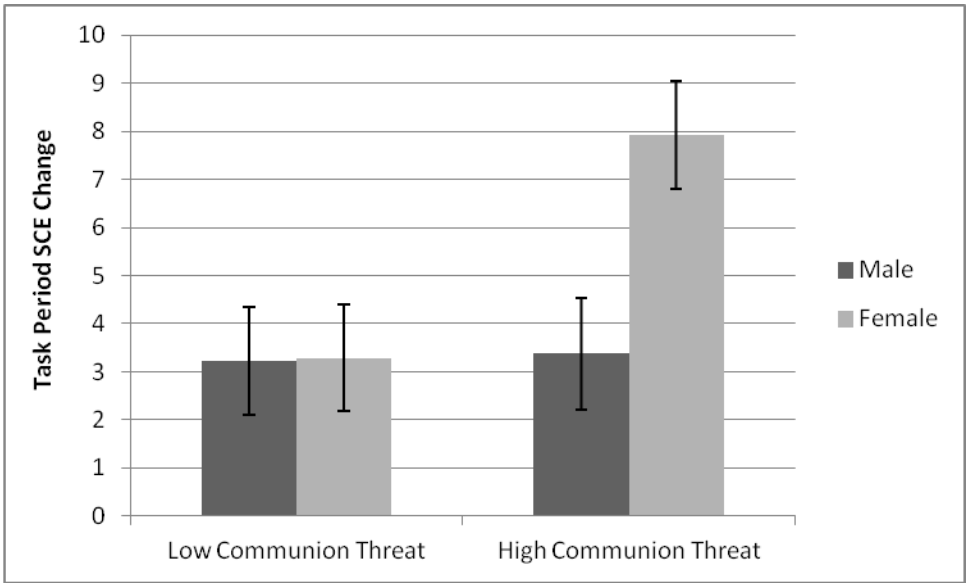

Figure 3. The effect of the communion threat condition on change in self-conscious emotions in males and females.

Physiology

The following results present the findings of physiological reactivity averaged across the task activities (i.e., talking, listening, and role playing). See Figure 4 for a summary of the effects of agency threat and communion threat on overall task period systolic blood pressure, diastolic blood pressure, heart rate, and salivary cortisol changes (task average – baseline value).

Blood pressure. During the task period, systolic (SBP) and diastolic blood pressure (DBP) significantly increased in both the agency and communion threat conditions (see Table 2). Gender was not associated with SBP change, $F(1,145) = .11$, $p = .74$, $\eta^2 = .001$, nor with DBP change, $F(1,145) = 1.30$, $p = .26$, $\eta^2 = .010$. The combined agency and communion threat condition also resulted in increased SBP change, $F(1,145) = 6.38$, $p = .01$, $\eta^2 = .045$, and DBP change, $F(1,145) = 7.19$, $p = .008$, $\eta^2 = .051$.

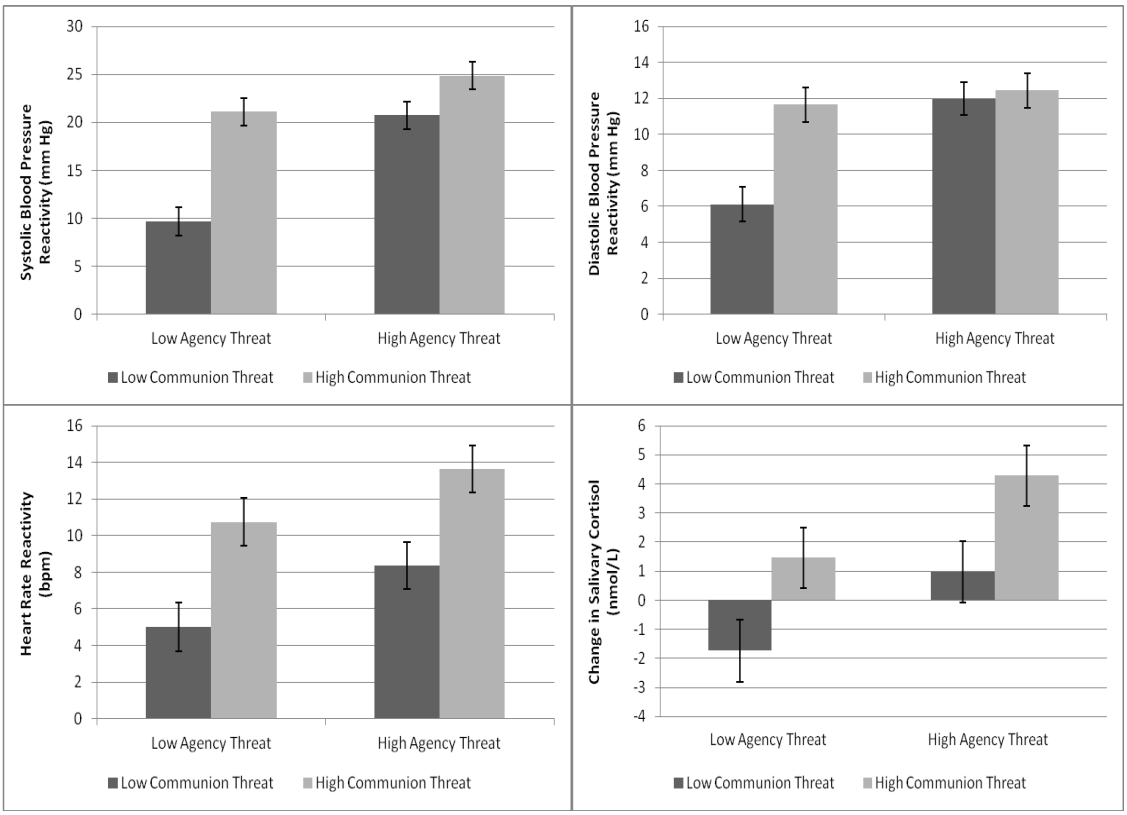

Figure 4. Summary of the effects of agency threat and communion threat on overall task period systolic blood pressure, diastolic blood pressure, heart rate, and salivary cortisol changes (task average – baseline value).

Additionally, for SBP change, the interaction between communion and gender approached significance (p = .057). Contrary to previous research (Bloor, Uchino, Hicks, & Smith, 2004; T. W. Smith, Uchino, et al., 2011; T. W. Smith et al., 2013), the communion threat condition resulted in greater systolic blood pressure change in males compared to females.

During the recovery period, SBP – but not DBP – continued to be elevated in both threat conditions (see Table 2). Gender approached significance in its association with SBP during the recovery period, $F(1,145) = 3.45$, p = .065, η^2 = .025. For SBP change

during the recovery period, the effect of combined agency and communion threat was no longer significant, $F(1,145) = 3.03$, $p = .084$, $\eta^2 = .022$. The interaction between communion threat and gender continued to approach significance, $F(1,145) = 3.76$, $p = .055$, $\eta^2 = .027$, similar to the task period results.

Heart rate. During the task period, both agency threat and communion threat were associated with increased heart rate reactivity (see Table 2). There was a significant main effect for gender, $F(1,145) = 4.96$, $p = .03$, $\eta^2 = .036$, such that women had greater increases in heart rate compared to men. No interactions were significant. During the recovery period, the above associations were no longer significant.

Cortisol. Compared to baseline, cortisol significantly increased in both the agency and communion threat conditions (see Table 2). Gender was not associated with cortisol change, $F(1,145) = .002$, $p = .97$, $\eta^2 = .000$, and no interactions approached significance.

Interpersonal goals. The R/S factors influenced the self-rated interpersonal values during the tasks (see Tables 3 and 4). Individuals high in RSadaptive desired concern and consideration from others. Individuals high in RSmaladaptive, on the other hand, wanted to appear unemotional and detached. There was also a trend towards wanting to avoid ridicule and rejection during the tasks. For both the nonjudgmental awareness and active noticing factors, there was a desire to express oneself openly and to be heard and respected during the tasks.

Table 3

Model Summary of R/S factors on CSIV dominance and affiliation controlling for condition. Step 1 included agency threat and communion threat. Step 2 included CSIV dominance and affiliation

Factor	Steps	*R*	*F* change	Significance
RSadaptive	Step 1	.13	.97	.38
	Step 2	.35	6.74	.002
RSmaladaptive	Step 1	.24	3.53	.032
	Step 2	.36	4.62	.012
Nonjudgmental Awareness	Step 1	.25	3.79	.025
	Step 2	.40	6.96	.001
Active Noticing	Step 1	.08	.36	.70
	Step 2	.27	4.10	.019

Table 4

Coefficients for CSIV dominance and affiliation controlling for condition

Factor	Model 2	Beta	*t*	Significance
RSadaptive	Agency	.079	.88	.38
	Communion	-.13	-1.39	.17
	CSIVdom	.09	.92	.36
	CSIVlov	.33	3.65	.000
RSmaladaptive	Agency	.17	1.88	.063
	Communion	.13	1.46	.15
	CSIVdom	-.16	-1.71	.09
	CSIVlov	-.24	-2.72	.008
Nonjudgmental Awareness	Agency	-.09	-.94	.33
	Communion	-.20	-2.29	.024
	CSIVdom	.19	2.05	.043
	CSIVlov	.31	3.49	.001
Active Noticing	Agency	-.02	-.22	.82
	Communion	-.03	-.27	.79
	CSIVdom	.22	2.28	.025
	CSIVlov	.20	2.19	.031

Regression Analyses

R/S factors predicting affective change

The RSadaptive factor did not predict change in affect but the RSmaladaptive factor did. There was a main effect on average self-conscious emotion change (β = .239, t = 2.657, $p < .01$) and on average anger change (β = .236, t = 2.517, $p < .05$), such that higher scores on the RSmaladaptive factor were associated with larger increases in negative affect. There was also an interaction between the RSmaladaptive factor and the communion threat condition (β = .287, t = 3.051, $p < .01$). For individuals who had a higher RSmaladaptive factor score, there was a greater increase in anger after the task period, but only in the high communion threat condition (see Figure 5).

The nonjudgmental awareness factor produced two main effects on affective change: (a) average self-conscious emotion change (β = -.236, t = -2.605, $p < .01$), and (b) average anger change (β = -.291, t = -3.143, $p < .01$), such that high scores on nonjudgmental awareness were associated with smaller changes in negative affect. There was a similar trend for the active noticing factor influencing average self-conscious emotion change (β = -.159, t = -1.788, $p = .076$).

R/S factors predicting physiological change

The vast majority of the main effects of the R/S factors were not significant. There were two associations that were significant. The RSadaptive factor predicted heart rate during the recovery period (β = .221, t = 2.344, $p < .05$), such that high scores on RSadaptive were associated with an increased difference between heart rate during the recovery period and the baseline period. The nonjudgmental awareness factor predicted

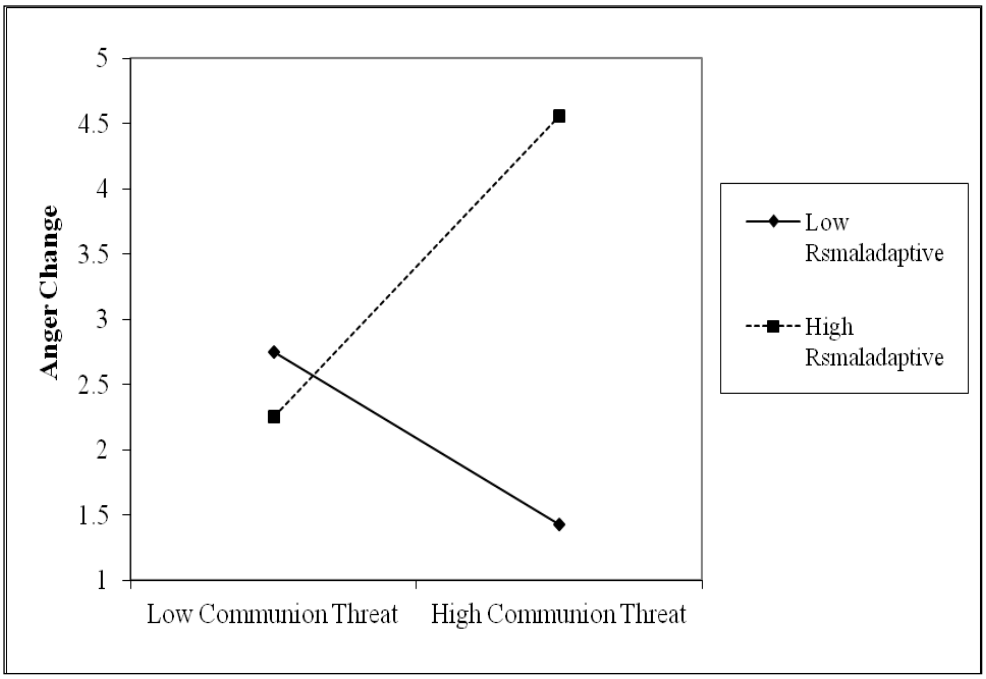

Figure 5. Interaction between the RSmaladaptive factor and communion threat

average cortisol change ($\beta = .193$, $t = 2.095$, $p < .05$). Individuals scoring higher on the nonjudgmental awareness factor had a greater increase in average cortisol change compared to individuals scoring lower on this factor.

DISCUSSION

Overall, the results demonstrate that when faced with a social evaluative threat, the participants in this study reported increased self-conscious emotions and anxiety, and displayed increases in blood pressure, heart rate, and cortisol. Furthermore, during the recovery period, the participants' anxiety remained elevated in the communion threat condition, and self-conscious emotions remained elevated in the agency threat condition. For both threat conditions, SBP remained elevated. These findings are consistent with social self preservation theory (Dickerson et al., 2004; Dickerson et al., 2008).

When being evaluated on friendliness, likeability, and interest (communion threat), participants reported a significant increase in state anxiety. There was also a trend towards an increase in state anxiety when being evaluated on competence, intelligence, and skill (agency threat). For change in self-conscious emotions, participants in both threat conditions reported being significantly more embarrassed, ashamed, and foolish. Compared to males, females reported a greater increase in self-conscious emotions. Notably, the experimental stressor had no effect on state anger and state pride.

During the task period, both threat conditions resulted in greater cardiovascular reactivity (i.e., SBP, DBP, and HR) and cortisol reactivity. Greater SBP reactivity, but not DBP reactivity, persisted during the recovery period. The above findings suggest that

social evaluative threat increases both cardiovascular and neuroendocrine (i.e., cortisol) reactivity.

Individual differences in various aspects of R/S did not predict these responses generally, and did not moderate the effects of threat. The only significant effects were a main effect of RSadaptive on heart rate during the recovery period and a main effect of nonjudgmental awareness on average cortisol change. The direction of these effects runs contrary to predictions, particularly in regard to the association between nonjudgmental awareness and *increased* cortisol reactivity. This finding is not unheard of (Laurent, Laurent, Hertz, Egan-Wright, & Granger, 2013), but based on the associated interpersonal style, one would predict *decreased* cortisol reactivity.

The general lack of findings is surprising given the warm interpersonal style associated with R/S (Jordan et al., in press), which was largely replicated in this study. A warm interpersonal style has been found to be associated with a salubrious physiological profile (Christensen & Smith, 1993; Gallo, Smith, & Kircher, 2000; T. W. Smith & Gallo, 1999; T. W. Smith, Ruiz, & Uchino, 2004), and this study did not replicate these findings.

There are a number of possible reasons for these null findings. First, the use of self-report to assess individual differences in R/S may have been susceptible to social desirability artifacts. Second, the stressor may have had limited relevance to R/S individuals. Third, the interpersonal features of R/S could influence health and well-being more so through stress exposure and restoration rather than stress reactivity and recovery.

Concerning the first of these potential limitations that may have contributed to the largely null results, there is evidence that people overreport a number of socially

desirable behaviors, such as voting and church attendance (Hadaway, Marler, & Chaves, 1993; Presser & Traugott, 1992). This potential limitation applies to some of the individual items in the scales used in the present study that refer to behaviors (i.e., church attendance, private prayer, scriptural reading), but it may not apply to other items that assess attitudes/preferences (e.g., importance of religiousness, religious motivations, spiritual strivings). However, even attitudes might be susceptible to social desirability effects (Burris & Jackson, 2000; Rowatt, Ottenbreit, Nesselroade, & Cunningham, 2002). For example, Burton and Blair (1991) suggest that people have strong internalized rules (e.g., personalized rules) that have developed since childhood. These "rules" are part of long-term memory and may lead to overreporting. For example, a person might have a well-rehearsed rule such as, "I go to church every week," or "I am a good Mormon." These rules can influence not only reporting of behaviors, but potentially attitudes, as well.

Related to concerns of social desirability effects is common method variance. A significant criticism of R/S research is that many measures of R/S include item content that overlaps with criterion variables (Galen, 2012). If the association between affiliation on the IPC and R/S is due to a content artifact related to common method variance, then the putative interpersonal features of R/S might play little, if any, role in the salubrious effects of R/S on health and well-being.

Second, the stressors used in the present study – though clearly effective in evoking expected affective and physiological responses – may have not included a proximal activation of R/S. In other words, the hypothesized salubrious ingredient of R/S (i.e., interpersonal features) that the present study predicted would influence

physiological outcomes might not have been "activated" during the laboratory stressor. The interpersonal style associated with adaptive R/S is generally warm, but this does not mean that warm interpersonal behavior and goals will be apparent across all situations. For example, atheistic individuals who identify strongly with a civic ideal might share many similarities with individuals who identify strongly with a religious or spiritual ideal. However, unless there is a proximal activation of a civic ideal (like justice), a research study might not find salubrious effects in a study of atheists.

In the present study, R/S was studied from a very decontextualized perspective. The experimental rigor was notable, but it may have had the unintended consequence of being unrealistic, or inapplicable, for contextualized R/S (Masters & Hooker, 2013). The cultural milieu is important in regard to how R/S is manifested, which has a clear impact on research findings. For example, in a study among Mormons, behavioral cooperation was found to be higher in Utah compared to Oregon (Orbell, Goldman, Mulford, & Dawes, 1992).

Third, the present study examined two pathways (i.e., reactivity and recovery) through which R/S might influence health and well-being. The stress-reactivity hypothesis as it relates to the cardiovascular system predicts that people who have greater and more prolonged cardiovascular reactions to behavioral or interpersonal stimuli are at a higher risk of developing or exacerbating cardiovascular disease. Additional pathways to health include exposure to stressful stimuli and restoration such as sleep. The present study had a brief (i.e., 5 minutes) recovery period. A longer recovery period could examine whether a "prevailing state" of physiological reactivity is occurring. A comprehensive reactivity study would examine the stress processes of exposure,

reactivity, recovery, and restoration at the same time (Williams, Rau, Cribbet, & Gunn, 2009).

It is possible that R/S assists stress regulation by limiting the exposure one has to stressful environments and events. Before a person can "react" to a stressful life event, he or she must be exposed to it. This statement is self-evident, but it is useful to consider whether individuals high in adaptive R/S are exposed to fewer stressful events or hassles in their lives. Additionally, there might be something about R/S that exposes the person to more stress-dampening events. Either way, the result would be fewer opportunities at reactivity, which would presumably be conducive to one's health. It is important to note that in the interpersonal perspective the warm interpersonal style associated with the adaptive aspects of R/S and some aspects of mindfulness would be expected to be associated with less exposure to interpersonal stressors and greater exposure to stress-buffering social support.

It is known that exposure to stressful events is positively related to maladjustment and poor health outcomes (Leserman, Li, Hu, & Drossman, 1998). This idea of less exposure to a noxious stimulus is not frequently studied in the psychology of religion literature. There is limited evidence that different dimensions of R/S may be uniquely associated with exposure to stressful circumstances (Jordan et al., in press). Some aspects of R/S may allow people to create salubrious interpersonal environments in which exposure to stressful interpersonal events is lessened. According to the principle of complementarity, the warm interpersonal style associated with adaptive aspects of R/S will tend to elicit and maintain friendly interactions with others, resulting in less stress exposure. In the R/S literature, the process of sanctification might also apply. Individuals

may sanctify physical space, which may limit stress exposure (Dabrowska & Bates, 2010). Similarly, the behavioral repertoire associated with R/S might "shield" these individuals from adverse or compromising environments (Chen, Dormitzer, Bejarano, & Anthony, 2004; Chen et al., 2004). The exposure hypothesis as a mechanism linking R/S with health and well-being could be tested using a daily diary protocol (Hahn, 2000).

Whereas the individual aspects of R/S in the present study did not did moderate the effects of acute stress, they may influence reactivity to repeated or chronic stress. The beneficial effect of R/S on health and well-being might occur via habituation to recurrence of the same stressors over time. One way to test this hypothesis would be an experimental protocol in which the same stressor was used over multiple days to examine how participants responded physiologically each time (Kirschbaum et al., 1995). Another method could employ a daily diary protocol with chronic stress, as opposed to acute stressors, as the focus of the study.

In addition to exposure and reactivity, restoration might be another pathway by which R/S influences health and well-being. Poorly regulated and insufficient sleep predicts morbidity and mortality (Mullington, Haack, Toth, Serrador, & Meier-Ewert, 2009), and studies of sleep deprivation have found that inflammatory markers are elevated and cardiovascular functioning can be impaired (Motivala, Sarfatti, Olmos, & Irwin, 2005; Sauvet et al., 2010). There is mixed evidence on the association between aspects of R/S and sleep quality/habits (Gillum, 2013). There is some evidence that variables associated with R/S – forgiveness, prayerful states, and gratitude – promote better sleep (Lawler-Row, 2010; Masters & Spielmans, 2007; Wood et al., 2009).

Research has accumulated suggesting that R/S buffers against morbidity and mortality. R/S is associated with health, but the mechanisms remain poorly understood. Various mechanisms have been proposed (e.g., health behaviors, social support), and to varying degrees, these mechanisms have partly explained the relationship between R/S and health outcomes. An additional mechanism pertains to the reactivity hypothesis and the influence of stress on health outcomes. The present study did not provide evidence that R/S moderates reactivity to or short-term recovery from social evaluative threat, but future studies can be conducted in a more diverse sample, with different assessment methods, and with awareness that religion is a cultural variable. Using experimental methods that are culturally relevant is likely to provide a more realistic test of the reactivity hypothesis.

REFERENCES

Ai, A. L., Park, C. L., Huang, B., Rodgers, W., & Tice, T. N. (2007). Psychosocial mediation of religious coping styles: A study of short-term psychological distress following cardiac surgery. *Personality and Social Psychology Bulletin, 33*(6), 867-882.

Argyle, M., & Beit-Hallahmi, B. (1975). *The social psychology of religion*. Oxford, England: Routledge & Kegan Paul.

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment, 11*(3), 191-206. doi: 10.1177/1073191104268029

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27-45. doi: 10.1177/1073191105283504

Bergin, A. E., Masters, K. S., & Richards, P. S. (1987). Religiousness and mental health reconsidered: A study of an intrinsically religious sample. *Journal of Counseling Psychology, 34*, 197-204.

Bloor, L. E., Uchino, B. N., Hicks, A., & Smith, T. W. (2004). Social relationships and physiological function: The effects of recalling social relationships on cardiovascular reactivity. *Annals of Behavioral Medicine, 28*(1), 29-38. doi: 10.1207/s15324796abm2801_5

Bosch, J. A., De Geus, E. J. C., Carroll, D., Goedhart, A. D., Anane, L. A., Zanten, J. J. V., et al. (2009). A general enhancement of autonomic and cortisol responses during social evaluative threat. *Psychosomatic Medicine, 71*(8), 877-885. doi: 10.1097/PSY.0b013e3181baef05

Brady, M. J., Peterman, A. H., Fitchett, G., & Cella, D. (1999). *The expanded version of the Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale (FACIT-Sp-Ex): Initial report of psychometric properties*. Paper presented at the Society of Behavioral Medicine, San Francisco.

Burris, C. T., & Jackson, L. M. (2000). Social identity and the true believer: Responses to threatened self-stereotypes among the intrinsically religious. *British Journal of Social Psychology, 39*(2), 257-278. doi: 10.1348/014466600164462

Burton, S., & Blair, E. (1991). Task conditions, response formulation processes, and response accuracy for behavioral frequency questions in surveys. *Public Opinion Quarterly, 55*(1), 50-79. doi: 10.1086/269241

Chen, C.-Y., Dormitzer, C. M., Bejarano, J., & Anthony, J. C. (2004). Religiosity and the earliest stages of adolescent drug involvement in seven countries of Latin America. *American Journal of Epidemiology, 159*(12), 1180-1188.

Chen, C.-Y., Dormitzer, C. M., Gutiérrez, U., Vittetoe, K., González, G. B., & Anthony, J. C. (2004). The adolescent behavioral repertoire as a context for drug exposure: Behavioral autarcesis at play. *Addiction (Abingdon, England), 99*(7), 897-906.

Chida, Y., & Steptoe, A. (2010). Greater cardiovascular responses to laboratory mental stress are associated with poor subsequent cardiovascular risk status: A meta-analysis of prospective evidence. *Hypertension, 55*(4), 1026-1032.

Chida, Y., Steptoe, A., & Powell, L. H. (2009). Religiosity/spirituality and mortality. *Psychotherapy and Psychosomatics, 78*(2), 81-90.

Christensen, A. J., & Smith, T. W. (1993). Cynical hostility and cardiovascular reactivity during self-disclosure. *Psychosomatic Medicine, 55*(2), 193-202.

Christopher, M. S., & Gilbert, B. D. (2010). Incremental validity of components of mindfulness in the prediction of satisfaction with life and depression. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues, 29*(1), 10-23. doi: 10.1007/s12144-009-9067-9

Comstock, G. W., & Partridge, K. B. (1972). Church attendance and health. *Journal of Chronic Diseases, 25*(12), 665-672.

Dabrowska, E. M., & Bates, J. (2010). The health beliefs of Old Order Mennonite women in rural Ontario, Canada. *CJNR: Canadian Journal of Nursing Research, 42*(1), 92-111.

Dickerson, S. S. (2011). Physiological responses to experiences of social pain. In G. MacDonald & L. A. Jensen-Campbell (Eds.), *Social pain: Neuropsychological and health implications of loss and exclusion* (pp. 79-94). Washington, DC: American Psychological Association.

Dickerson, S. S., Gruenewald, T. L., & Kemeny, M. E. (2004). When the social self is threatened: Shame, physiology, and health. *Journal of Personality, 72*(6), 1191-1216.

Dickerson, S. S., Mycek, P. J., & Zaldivar, F. (2008). Negative social evaluation, but not mere social presence, elicits cortisol responses to a laboratory stressor task. *Health Psychology, 27*(1), 116-121. doi: 10.1037/0278-6133.27.1.116

Doyle, D. (1992). Have we looked beyond the physical and psychosocial? *Journal of Pain and Symptom Management, 7*(5), 302-311. doi: 10.1016/0885-3924(92)90063-n

Dressendörfer, R. A., Kirschbaum, C., Rohde, W., Stahl, F., & Strasburger, C. J. (1992). Synthesis of a cortisol-biotin conjugate and evaluation as a tracer in an immunoassay for salivary cortisol measurement. *The Journal of Steroid Biochemistry and Molecular Biology, 43*(7), 683-692.

Eisenberger, N. I. (2012). The neural bases of social pain: Evidence for shared representations with physical pain. *Psychosomatic Medicine, 74*(2), 126-135. doi: 10.1097/PSY.0b013e3182464dd1

Ellison, C. G., & Flannelly, K. J. (2009). Religious involvement and risk of major depression in a prospective nationwide study of African American adults. *The Journal of Nervous and Mental Disease, 197*(8), 568-573.

Emmons, R. A. (2009). Greatest of the virtues? Gratitude and the grateful personality. In D. Narvaez & D. K. Lapsley (Eds.), *Personality, identity, and character: Explorations in moral psychology* (pp. 256-270). New York, NY: Cambridge University Press.

Emmons, R. A., & Kneezel, T. T. (2005). Giving thanks: Spiritual and religious correlates of gratitude. *Journal of Psychology and Christianity, 24*(2), 140-148.

Fetzer Institute/NIA. (1999). *Multidimensional measure of religiousness/spirituality for use in health research: A report of the Fetzer Institute/National Institute on Aging working group*. Kalamazoo, MI: Fetzer Institute.

Froh, J. J., Sefick, W. J., & Emmons, R. A. (2008). Counting blessings in early adolescents: An experimental study of gratitude and subjective well-being. *Journal of School Psychology, 46*(2), 213-233. doi: 10.1016/j.jsp.2007.03.005

Galen, L. W. (2012). Does religious belief promote prosociality? A critical examination. *Psychological Bulletin, 138*(5), 876-906. doi: 10.1037/a0028251

Gallo, L. C., Smith, T. W., & Kircher, J. C. (2000). Cardiovascular and electrodermal responses to support and provocation: Interpersonal methods in the study of psychophysiological reactivity. *Psychophysiology, 37*(3), 289-301. doi: 10.1017/s0048577200982222

Gallo, L. C., Smith, T. W., & Ruiz, J. M. (2003). An interpersonal analysis of adult attachment style: Circumplex descriptions, recalled developmental experiences, self-representations and interpersonal functioning in adulthood. *Journal of Personality, 71*(2), 141-181.

George, L. K., Ellison, C. G., & Larson, D. B. (2002). Explaining the relationships between religious involvement and health. *Psychological Inquiry, 13*(3), 190-200. doi: 10.1207/s15327965pli1303_04

George, L. K., Larson, D. B., Koenig, H. G., & McCullough, M. E. (2000). Spirituality and health: What we know, what we need to know. *Journal of Social and Clinical Psychology, 19*(1), 102-116.

Gerin, W., Davidson, K. W., Christenfeld, N. J. S., Goyal, T., & Schwartz, J. E. (2006). The role of angry rumination and distraction in blood pressure recovery from emotional arousal. *Psychosomatic Medicine, 68*(1), 64-72. doi: 10.1097/01.psy.0000195747.12404.aa

Gillum, R. F. (2013). Religious behavior, sleep quantity, sleep quality, and sleep disorders in American adults. *The Journal of Behavioral Health Services & Research, 40*(1), 133-134. doi: 10.1007/s11414-012-9309-8

Gorsuch, R. L., & McPherson, S. E. (1989). Intrinsic/extrinsic measurement: I/E-revised and single-item scales. *Journal for the Scientific Study of Religion, 28*(3), 348-354. doi: 10.2307/1386745

Gruenewald, T. L., Kemeny, M. E., Aziz, N., & Fahey, J. L. (2004). Acute threat to the social self: Shame, social self-esteem, and cortisol activity. *Psychosomatic Medicine, 66*(6), 915-924. doi: 10.1097/01.psy.0000143639.61693.ef

Hackney, C. H., & Sanders, G. S. (2003). Religiosity and mental health: A meta-analysis of recent studies. *Journal for the Scientific Study of Religion, 42*(1), 43-55.

Hadaway, C. K., Marler, P. L., & Chaves, M. (1993). What the polls don't show: A closer look at U.S. church attendance. *American Sociological Review, 58*(6), 741-752. doi: 10.2307/2095948

Hahn, S. E. (2000). The effects of locus of control on daily exposure, coping and reactivity to work interpersonal stressors: A diary study. *Personality and Individual Differences, 29*(4), 729-748. doi: 10.1016/s0191-8869(99)00228-7

Harris, A. H. S., & Thoresen, C. (2005). Forgiveness, unforgiveness, health, and disease. In E. L. Worthington, Jr. (Ed.), *Handbook of forgiveness* (pp. 321-333). New York, NY: Routledge.

Helm, H. M., Hays, J. C., Flint, E. P., Koenig, H. G., & Blazer, D. G. (2000). Does private religious activity prolong survival? A six-year follow-up study of 3,851 older adults. *The Journals of Gerontology: Series A: Biological Sciences and Medical Sciences, 55A*(7), M400-M405.

Holt-Lunstad, J., Steffen, P. R., Sandberg, J., & Jensen, B. (2011). Understanding the connection between spiritual well-being and physical health: An examination of ambulatory blood pressure, inflammation, blood lipids and fasting glucose. *Journal of Behavioral Medicine, 34*(6), 477-488. doi: 10.1007/s10865-011-9343-7

Horowitz, L. M., & Strack, S. (2011). *Handbook of interpersonal psychology: Theory, research, assessment, and therapeutic interventions*. Hoboken, NJ: John Wiley & Sons.

Horowitz, L. M., Wilson, K. R., Turan, B., Zolotsev, P., Constantino, M. J., & Henderson, L. (2006). How interpersonal motives clarify the meaning of interpersonal behavior: A revised circumplex model. *Personality and Social Psychology Review, 10*(1), 67-86. doi: 10.1207/s15327957pspr1001_4

House, J. S., Robbins, C., & Metzner, H. L. (1982). The association of social relationships and activities with mortality: Prospective evidence from the Tecumseh Community Health Study. *American Journal of Epidemiology, 116*(1), 123-140.

Hummer, R. A., Rogers, R. G., Nam, C. B., & Ellison, C. G. (1999). Religious involvement and U.S. adult mortality. *Demography, 36*(2), 273-285.

Idler, E. L., Musick, M. A., Ellison, C. G., George, L. K., Krause, N., Ory, M. G., et al. (2003). Measuring multiple dimensions of religion and spirituality for health research: Conceptual background and findings from the 1998 General Social Survey. *Research on Aging, 25*(4), 327-365.

Ironson, G., Soloman, G. F., Balbin, E. G., O'Cleirigh, C., George, A., Kumar, M., et al. (2002). The Ironson-Woods Spirituality/Religiousness Index is associated with long survival, health behaviors, less distress, and low cortisol in people with HIV/AIDS. *Annals of Behavioral Medicine, 24*(1), 34-48. doi: 10.1207/s15324796abm2401_05

Johnson, T. J., Sheets, V. L., & Kristeller, J. L. (2008). Identifying mediators of the relationship between religiousness/spirituality and alcohol use. *Journal of Studies on Alcohol and Drugs, 69*(1), 160-170.

Johnstone, B., McCormack, G., Yoon, D. P., & Smith, M. L. (2012). Convergent/divergent validity of the Brief Multidimensional Measure of Religiousness/Spirituality: Empirical support for emotional connectedness as a

"spiritual" construct. *Journal of Religion and Health, 51*(2), 529-541. doi: 10.1007/s10943-011-9538-9

Jordan, K. D., Masters, K. S., Hooker, S. A., Ruiz, J. M., & Smith, T. W. (in press). An interpersonal approach to religiousness and spirituality: Implications for health and well-being. *Journal of Personality*.

Kamarck, T. W., Jennings, J. R., Debski, T. T., & Glickman-Weiss, E. (1992). Reliable measures of behaviorally-evoked cardiovascular reactivity from a PC-based test battery: Results from student and community samples. *Psychophysiology, 29*(1), 17-28. doi: 10.1111/j.1469-8986.1992.tb02006.x

King, D. E., & Pearson, W. S. (2003). Religious attendance and continuity of care. *International Journal of Psychiatry in Medicine, 33*(4), 377-389.

Kirschbaum, C., Prüssner, J. C., Stone, A. A., Federenko, I., Gaab, J., Lintz, D., et al. (1995). Persistent high cortisol responses to repeated psychological stress in a subpopulation of healthy men. *Psychosomatic Medicine, 57*(5), 468-474.

Koenig, H. G., McCullough, M. E., & Larson, D. B. (2001). *Handbook of religion and health*. New York, NY: Oxford University Press.

Krause, N. (2006). Gratitude toward God, stress, and health in late life. *Research on Aging, 28*(2), 163-183. doi: 10.1177/0164027505284048

Lapierre, L. L. (1994). A model for describing spirituality. *Journal of Religion and Health, 33*(2), 153-161.

Laurent, H., Laurent, S., Hertz, R., Egan-Wright, D., & Granger, D. A. (2013). Sex-specific effects of mindfulness on romantic partners' cortisol responses to conflict and relations with psychological adjustment. *Psychoneuroendocrinology, 38*(12), 2905-13.

Lawler-Row, K. A. (2010). Forgiveness as a mediator of the religiosity—health relationship. *Psychology of Religion and Spirituality, 2*(1), 1-16. doi: 10.1037/a0017584

Lawler, K. A., Younger, J. W., Piferi, R. L., Jobe, R. L., Edmondson, K. A., & Jones, W. H. (2005). The unique effects of forgiveness on health: An exploration of pathways. *Journal of Behavioral Medicine, 28*(2), 157-167. doi: 10.1007/s10865-005-3665-2

Leary, M. R., Cottrell, C. A., & Phillips, M. (2001). Deconfounding the effects of dominance and social acceptance on self-esteem. *Journal of Personality and Social Psychology, 81*(5), 898-909. doi: 10.1037/0022-3514.81.5.898

Leserman, J., Li, Z., Hu, Y. J. B., & Drossman, D. A. (1998). How multiple types of stressors impact on health. *Psychosomatic Medicine, 60*(2), 175-181.

Levin, J. S., & Vanderpool, H. Y. (1987). Is frequent religious attendance really conducive to better health?: Toward an epidemiology of religion. *Social Science & Medicine, 24*(7), 589-600. doi: 10.1016/0277-9536(87)90063-3

Lewis, H. B. (1971). *Shame and guilt in neurosis*. New York, NY: International University Press.

Light, K. C. (2001). Hypertension and the reactivity hypothesis: The next generation. *Psychosomatic Medicine, 63*(5), 744-746.

Locke, K. D. (2000). Circumplex scales of interpersonal values: Reliability, validity, and applicability to interpersonal problems and personality disorders. *Journal of Personality Assessment, 75*(2), 249-267. doi: 10.1207/s15327752jpa7502_6

Locke, K. D. (2006). Interpersonal circumplex measures. In S. Strack (Ed.), *Differentiating normal and abnormal personality* (2nd ed., pp. 383-400). New York, NY: Springer Publishing Co.

Macdonald, G., & Leary, M. R. (2005). Why does social exclusion hurt? The relationship between social and physical pain. *Psychological Bulletin, 131*(2), 202-223.

Manuck, S. B. (1994). Cardiovascular reactivity in cardiovascular disease: "Once more unto the breach." *International Journal of Behavioral Medicine, 1*(1), 4-31.

Markey, P. M., & Markey, C. N. (2009). A brief assessment of the interpersonal circumplex: The IPIP-IPC. *Assessment, 16*(4), 352-361. doi: 10.1177/1073191109340382

Masters, K. S., Carey, K. B., Maisto, S. A., Caldwell, P. E., Wolfe, T. V., Hackney, H. L., et al. (2009). Psychometric examination of the Brief Multidimensional Measure of Religiousness/Spirituality among college students. *International Journal for the Psychology of Religion, 19*(2), 106-120. doi: 10.1080/10508610802711194

Masters, K. S., Hill, R. D., Kircher, J. C., Benson, T. L. L., & Fallon, J. A. (2004). Religious orientation, aging, and blood pressure reactivity to interpersonal and cognitive stressors. *Annals of Behavioral Medicine, 28*(3), 171-178. doi: 10.1207/s15324796abm2803_5

Masters, K. S., & Hooker, S. A. (2013). Religiousness/spirituality, cardiovascular disease, and cancer: Cultural integration for health research and intervention. *Journal of Consulting and Clinical Psychology, 81*(2), 206-216. doi: 10.1037/a0030813

Masters, K. S., Lensegrav-Benson, T. L., Kircher, J. C., & Hill, R. D. (2005). Effects of religious orientation and gender on cardiovascular reactivity among older adults. *Research on Aging, 27*(2), 221-240. doi: 10.1177/0164027504270678

Masters, K. S., & Spielmans, G. I. (2007). Prayer and health: Review, meta-analysis, and research agenda. *Journal of Behavioral Medicine, 30*(4), 329-338.

McAdams, D. P., Hoffman, B. J., Mansfield, E. D., & Day, R. (1996). Themes of agency and communion in significant autobiographical scenes. *Journal of Personality, 64*(2), 339-377. doi: 10.1111/j.1467-6494.1996.tb00514.x

McCullough, M. E., Hoyt, W. T., Larson, D. B., Koenig, H. G., & Thoresen, C. (2000). Religious involvement and mortality: A meta-analytic review. *Health Psychology, 19*(3), 211-222. doi: 10.1037/0278-6133.19.3.211

Miller, R., Plessow, F., Rauh, M., Gröschl, M., & Kirschbaum, C. (2013). Comparison of salivary cortisol as measured by different immunoassays and tandem mass spectrometry. *Psychoneuroendocrinology, 38*(1), 50-57. doi: 10.1016/j.psyneuen.2012.04.019

Milot, A. S., & Ludden, A. B. (2009). The effects of religion and gender on well-being, substance use, and academic engagement among rural adolescents. *Youth & Society, 40*(3), 403-425. doi: 10.1177/0044118x08316668

Moberg, D. O. (2002). Assessing and measuring spirituality: Confronting dilemmas of universal and particular evaluative criteria. *Journal of Adult Development, 9*(1), 47-60. doi: 10.1023/a:1013877201375

Motivala, S. J., Sarfatti, A., Olmos, L., & Irwin, M. R. (2005). Inflammatory markers and sleep disturbance in major depression. *Psychosomatic Medicine, 67*(2), 187-194.

Mullington, J. M., Haack, M., Toth, M., Serrador, J. M., & Meier-Ewert, H. K. (2009). Cardiovascular, inflammatory, and metabolic consequences of sleep deprivation. *Progress in Cardiovascular Diseases, 51*(4), 294-302. doi: 10.1016/j.pcad.2008.10.003

Nealey-Moore, J. B., Smith, T. W., Uchino, B. N., Hawkins, M. W., & Olson-Cerny, C. (2007). Cardiovascular reactivity during positive and negative marital interactions. *Journal of Behavioral Medicine, 30*(6), 505-519. doi: 10.1007/s10865-007-9124-5

Orbell, J., Goldman, M., Mulford, M., & Dawes, R. (1992). Religion, context, and constraint toward strangers. *Rationality and Society, 4*(3), 291-307.

Ortner, C. N. M., Kilner, S. J., & Zelazo, P. D. (2007). Mindfulness meditation and reduced emotional interference on a cognitive task. *Motivation and Emotion, 31*(4), 271-283. doi: 10.1007/s11031-007-9076-7

Park, C. L. (2007). Religiousness/spirituality and health: A meaning systems perspective. *Journal of Behavioral Medicine, 30*(4), 319-328. doi: 10.1007/s10865-007-9111-x

Park, C. L., Moehl, B., Fenster, J. R., Suresh, D. P., & Bliss, D. (2008). Religiousness and treatment adherence in congestive heart failure patients. *Journal of Religion, Spirituality & Aging, 20*(4), 249-266. doi: 10.1080/15528030802232270

Peterman, A. H., Fitchett, G., Brady, M. J., Hernandez, L., & Cella, D. (2002). Measuring spiritual well-being in people with cancer: The Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale (FACIT-Sp). *Annals of Behavioral Medicine, 24*(1), 49-58.

Pew Forum. (2008). U.S. Religious Landscape Survey. *The Pew Forum on Religion & Public LIfe* Retrieved May 3, 2010, from http://religions.pewforum.org/

Piedmont, R. L. (2004). *Assessment of spiritual and religious sentiment* (Technical Manual). Baltimore, MD: Author.

Piedmont, R. L., Ciarrochi, J. W., Dy-Liacco, G. S., & Williams, J. E. G. (2009). The empirical and conceptual value of the spiritual transcendence and religious involvement scales for personality research. *Psychology of Religion and Spirituality, 1*(3), 162-179. doi: 10.1037/a0015883

Pincus, A. L., & Ansell, E. B. (2003). Interpersonal theory of personality. In T. Millon & M. J. Lerner (Eds.), *Handbook of psychology: Personality and social psychology* (Vol. 5., pp. 209-229). Hoboken, NJ: John Wiley & Sons.

Powell, L. H., Shahabi, L., & Thoresen, C. E. (2003). Religion and spirituality: Linkages to physical health. *American Psychologist, 58*(1), 36-52. doi: 10.1037/0003-066x.58.1.36

Prati, G., & Pietrantoni, L. (2009). Optimism, social support, and coping strategies as factors contributing to posttraumatic growth: A meta-analysis. *Journal of Loss and Trauma, 14*(5), 364-388. doi: 10.1080/15325020902724271

Presser, S., & Traugott, M. (1992). Little white lies and social science models: Correlated response errors in a panel study of voting. *The Public Opinion Quarterly, 56*(1), 77-86.

Reblin, M., & Uchino, B. N. (2008). Social and emotional support and its implication for health. *Current Opinion in Psychiatry, 21*(2), 201-205. doi: 10.1097/YCO.0b013e3282f3ad89

Rowatt, W. C., Ottenbreit, A., Nesselroade, K. P., Jr., & Cunningham, P. A. (2002). On being holier-than-thou or humbler-than-thee: A social-psychological perspective on religiousness and humility. *Journal for the Scientific Study of Religion, 41*(2), 227-237. doi: 10.1111/1468-5906.00113

Sahdra, B. K., Shaver, P. R., & Brown, K. W. (2010). A scale to measure nonattachment: A Buddhist complement to Western research on attachment and adaptive functioning. *Journal of Personality Assessment, 92*(2), 116-127. doi: 10.1080/00223890903425960

Sauvet, F., Leftheriotis, G., Gomez-Merino, D., Langrume, C., Drogou, C., Van Beers, P., et al. (2010). Effect of acute sleep deprivation on vascular function in healthy subjects. *Journal of Applied Physiology (Bethesda, Md.: 1985), 108*(1), 68-75. doi: 10.1152/japplphysiol.00851.2009

Sherwood, A., Dolan, C. A., & Light, K. C. (1990). Hemodynamics of blood pressure responses during active and passive coping. *Psychophysiology, 27*(6), 656-668. doi: 10.1111/j.1469-8986.1990.tb03189.x

Smith, T. B., McCullough, M. E., & Poll, J. (2003). Religiousness and depression: Evidence for a main effect and the moderating influence of stressful life events. *Psychological Bulletin, 129*(4), 614-636. doi: 10.1037/0033-2909.129.4.614

Smith, T. W., Cribbet, M. R., Nealey-Moore, J. B., Uchino, B. N., Williams, P. G., MacKenzie, J., et al. (2011). Matters of the variable heart: Respiratory sinus arrhythmia response to marital interaction and associations with marital quality. *Journal of Personality and Social Psychology, 100*(1), 103-119. doi: 10.1037/a0021136

Smith, T. W., & Gallo, L. C. (1999). Hostility and cardiovascular reactivity during marital interaction. *Psychosomatic Medicine, 61*(4), 436-445.

Smith, T. W., Glazer, K., Ruiz, J. M., & Gallo, L. C. (2004). Hostility, anger, aggressiveness, and coronary heart disease: An interpersonal perspective on personality, emotion, and health. *Journal of Personality, 72*(6), 1217-1270. doi: 10.1111/j.1467-6494.2004.00296.x

Smith, T. W., Nealey, J. B., Kircher, J. C., & Limon, J. P. (1997). Social determinants of cardiovascular reactivity: Effects of incentive to exert influence and evaluative threat. *Psychophysiology, 34*(1), 65-73. doi: 10.1111/j.1469-8986.1997.tb02417.x

Smith, T. W., Ruiz, J. M., & Uchino, B. N. (2004). Mental activation of supportive ties, hostility, and cardiovascular reactivity to laboratory stress in young men and women. *Health Psychology, 23*(5), 476-485. doi: 10.1037/0278-6133.23.5.476

Smith, T. W., Traupman, E. K., Uchino, B. N., & Berg, C. A. (2010). Interpersonal circumplex descriptions of psychosocial risk factors for physical illness: Application to hostility, neuroticism, and marital adjustment. *Journal of Personality, 78*(3), 1011-1036. doi: 10.1111/j.1467-6494.2010.00641.x

Smith, T. W., Uchino, B. N., Florsheim, P., Berg, C. A., Butner, J., Hawkins, M., et al. (2011). Affiliation and control during marital disagreement, history of divorce, and asymptomatic coronary artery calcification in older couples. *Psychosomatic Medicine, 73*(4), 350-357. doi: 10.1097/PSY.0b013e31821188ca

Smith, T. W., Uchino, B. N., MacKenzie, J., Hicks, A. M., Campo, R. A., Reblin, M., et al. (2013). Effects of couple interactions and relationship quality on plasma oxytocin and cardiovascular reactivity: Empirical findings and methodological considerations. *International Journal of Psychophysiology, 88*(3), 271-281. doi: 10.1016/j.ijpsycho.2012.04.006

Spielberger, C. D. (1980). *Preliminary manual for the State-Trait Personality Inventory*. Tampa, FL: University of South Florida, Human Resources Institute.

Steffen, P. R., & Masters, K. S. (2005). Does compassion mediate the intrinsic religion-health relationship? *Annals of Behavioral Medicine, 30*(3), 217-224.

Strawbridge, W. J., Cohen, R. D., Shema, S. J., & Kaplan, G. A. (1997). Frequent attendance at religious services and mortality over 28 years. *American Journal of Public Health, 87*(6), 957-961. doi: 10.2105/ajph.87.6.957

Strawbridge, W. J., Shema, S. J., Cohen, R. D., & Kaplan, G. A. (2001). Religious attendance increases survival by improving and maintaining good health behaviors, mental health, and social relationships. *Annals of Behavioral Medicine, 23*(1), 68-74.

Tabachnick, B. G., & Fidell, L. S. (2006). *Using multivariate statistics* (5th ed.). Boston, MA: Allyn & Bacon.

Tartaro, J., Luecken, L. J., & Gunn, H. E. (2005). Exploring heart and soul: Effects of religiosity/spirituality and gender on blood pressure and cortisol stress responses. *Journal of Health Psychology, 10*(6), 753-766. doi: 10.1177/1359105305057311

Trapnell, P. D., & Campbell, J. D. (1999). Private self-consciousness and the five-factor model of personality: Distinguishing rumination from reflection. *Journal of Personality and Social Psychology, 76*(2), 284-304. doi: 10.1037/0022-3514.76.2.284

Treiber, F. A., Kamarck, T., Schneiderman, N., Sheffield, D., Kapuku, G., & Taylor, T. (2003). Cardiovascular reactivity and development of preclinical and clinical disease states. *Psychosomatic Medicine, 65*(1), 46-62.

Wallace, J. M., Jr., & Forman, T. A. (1998). Religion's role in promoting health and reducing risk among American youth. *Health Education & Behavior, 25*(6), 721-741. doi: 10.1177/109019819802500604

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070. doi: 10.1037/0022-3514.54.6.1063

Whittington, B. L., & Scher, S. J. (2010). Prayer and subjective well-being: An examination of six different types of prayer. *International Journal for the Psychology of Religion, 20*(1), 59-68. doi: 10.1080/10508610903146316

Wiggins, J. S. (1979). A psychological taxonomy of trait-descriptive terms: The interpersonal domain. *Journal of Personality and Social Psychology, 37*(3), 395-412. doi: 10.1037/0022-3514.37.3.395

Wiggins, J. S., Phillips, N., & Trapnell, P. (1989). Circular reasoning about interpersonal behavior: Evidence concerning some untested assumptions underlying diagnostic classification. *Journal of Personality and Social Psychology, 56*(2), 296-305. doi: 10.1037/0022-3514.56.2.296

Williams, P. G., Rau, H. K., Cribbet, M. R., & Gunn, H. E. (2009). Openness to experience and stress regulation. *Journal of Research in Personality, 43*(5), 777-784. doi: 10.1016/j.jrp.2009.06.003

Wood, A. M., Joseph, S., Lloyd, J., & Atkins, S. (2009). Gratitude influences sleep through the mechanism of pre-sleep cognitions. *Journal of Psychosomatic Research, 66*(1), 43-48.

Yeager, D. M., Glei, D. A., Au, M., Lin, H.-S., Sloan, R. P., & Weinstein, M. (2006). Religious involvement and health outcomes among older persons in Taiwan. *Social Science & Medicine, 63*(8), 2228-2241. doi: 10.1016/j.socscimed.2006.05.007

Ysseldyk, R., Matheson, K., & Anisman, H. (2007). Rumination: Bridging a gap between forgivingness, vengefulness, and psychological health. *Personality and Individual Differences, 42*(8), 1573-1584. doi: 10.1016/j.paid.2006.10.032

Zhang, W. (2008). Religious participation and mortality risk among the oldest old in China. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences, 63*(5), S293-S297.

Zinnbauer, B. J., Pargament, K. I., Cole, B., Rye, M. S., Butter, E. M., Belavich, T. G., et al. (1997). Religion and spirituality: Unfuzzying the fuzzy. *Journal for the Scientific Study of Religion, 36*(4), 549-564. doi: 10.2307/1387689

Zollinger, T. W., Phillips, R. L., & Kuzma, J. W. (1984). Breast cancer survival rates among Seventh-day Adventists and non-Seventh-day Adventists. *American Journal of Epidemiology, 119*(4), 503-509.

Zuckerman, D. M., Kasl, S. V., & Ostfeld, A. M. (1984). Psychosocial predictors of mortality among the elderly poor. The role of religion, well-being, and social contacts. *American Journal of Epidemiology, 119*(3), 410-423.